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B65D 83/20

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F1R RCB R103

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(54) Actuator cap for aerosol containers

(57) A cap is provided for use with tilt valve aerosol containers. An actuator (12) is mounted in the cap (17) by a pair of torsion hinges (14). Upon depressing the rear (17) of the actuator (12), the actuator rotates about the hinge axis. Consequently, an engagement means (35) on the underside of the actuator (12) contacts and displaces the valve stem (25) and, thereby, actuates the valve. A product flue (23) is positioned at the front of the actuator which flue is rotated with the actuator such that, on actuating the valve, the product stream from the valve stem proceeds through the flue.

Fig. 1

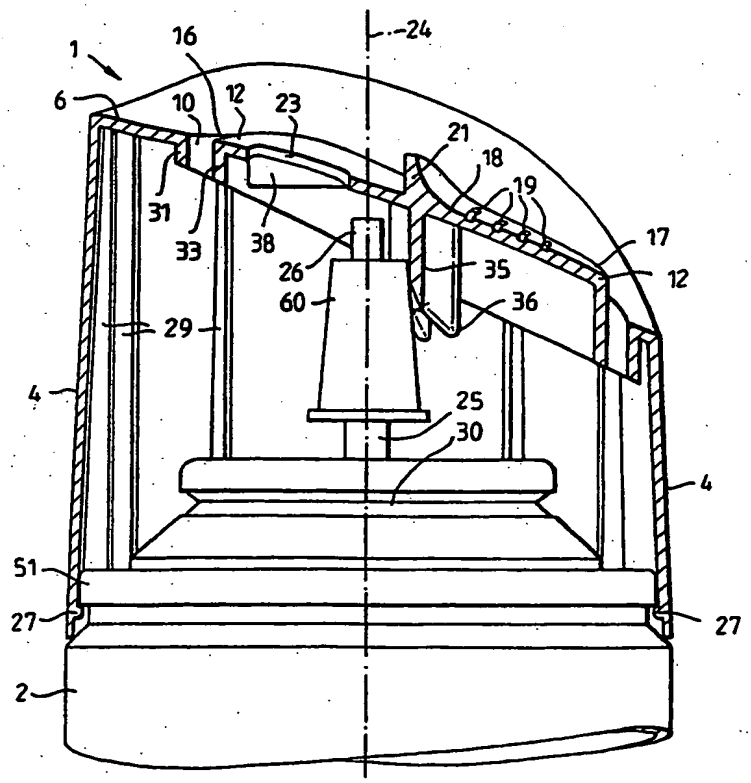
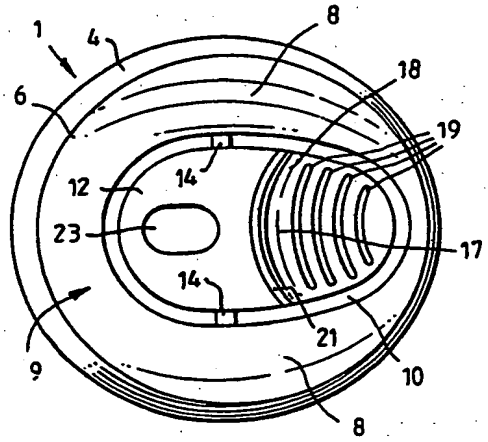


Fig. 2



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1

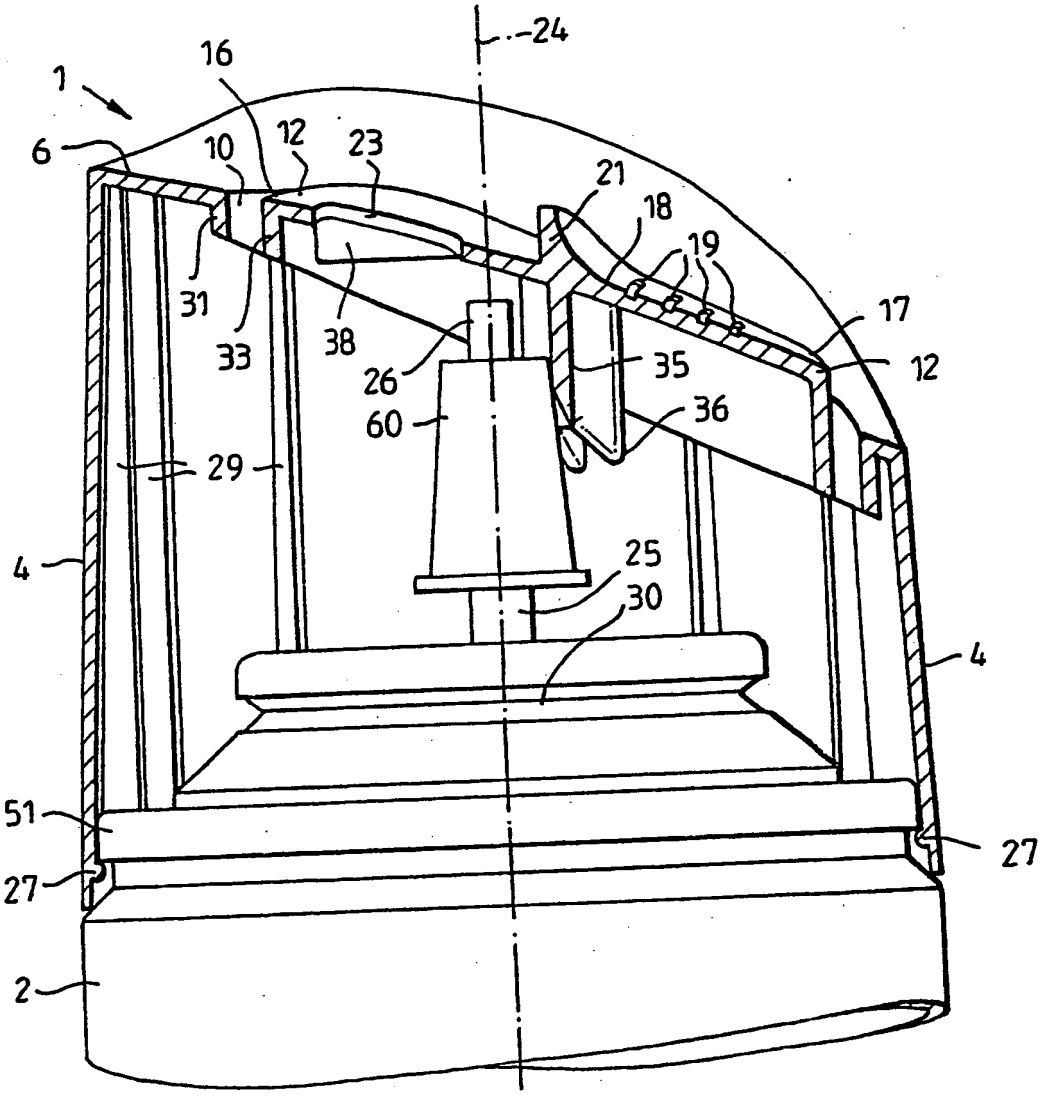
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Fig. 1A

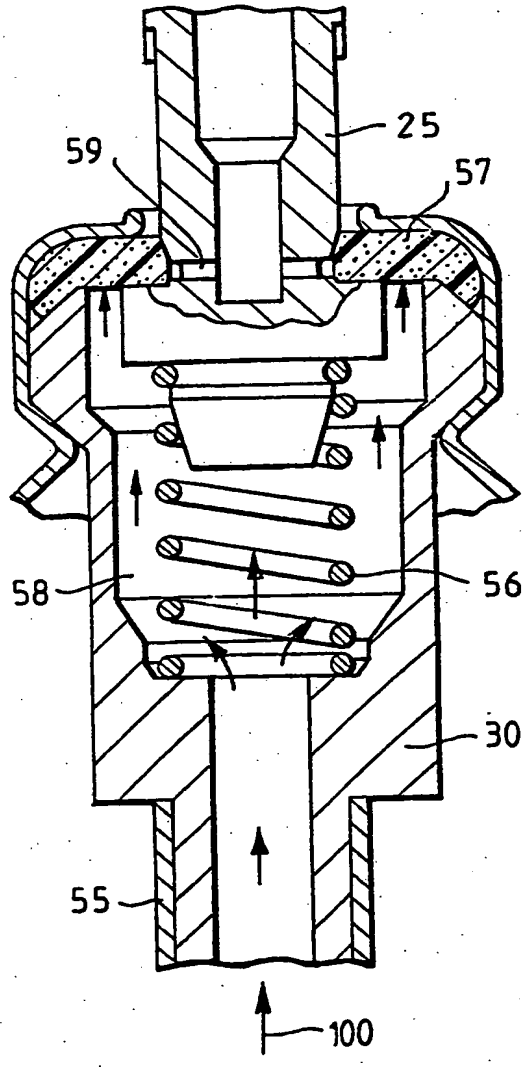


Fig. 5A

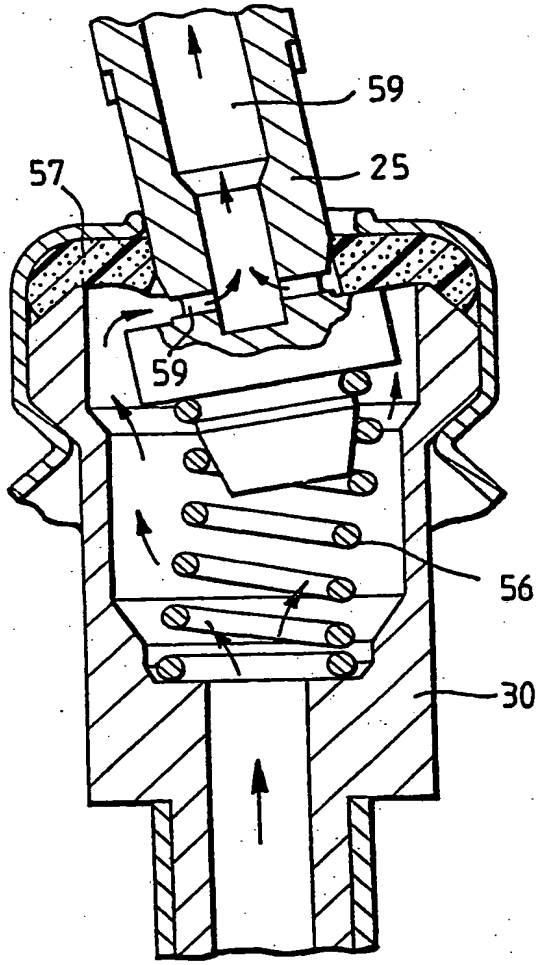


Fig. 2

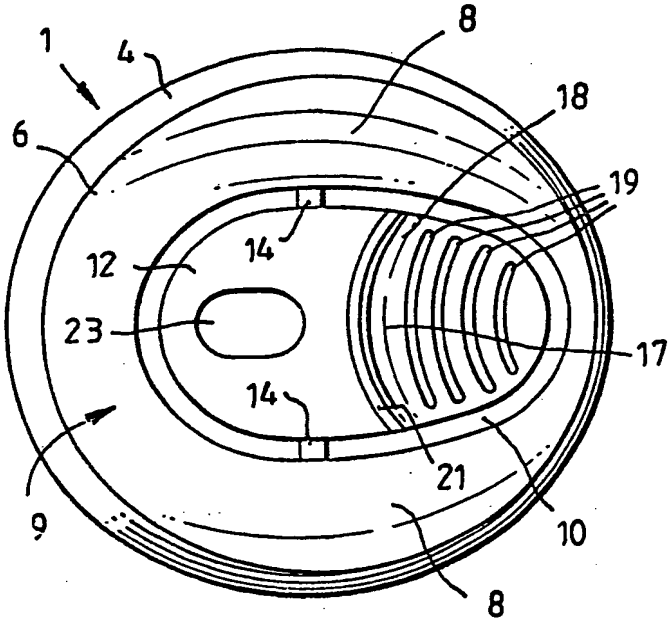


Fig. 3

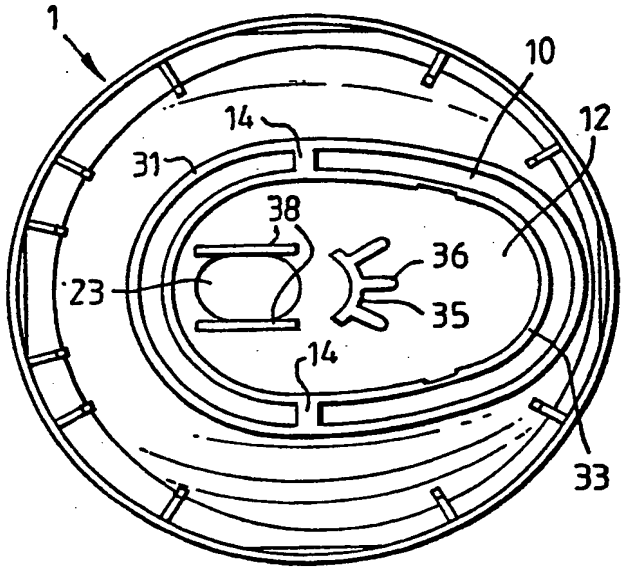


Fig. 4

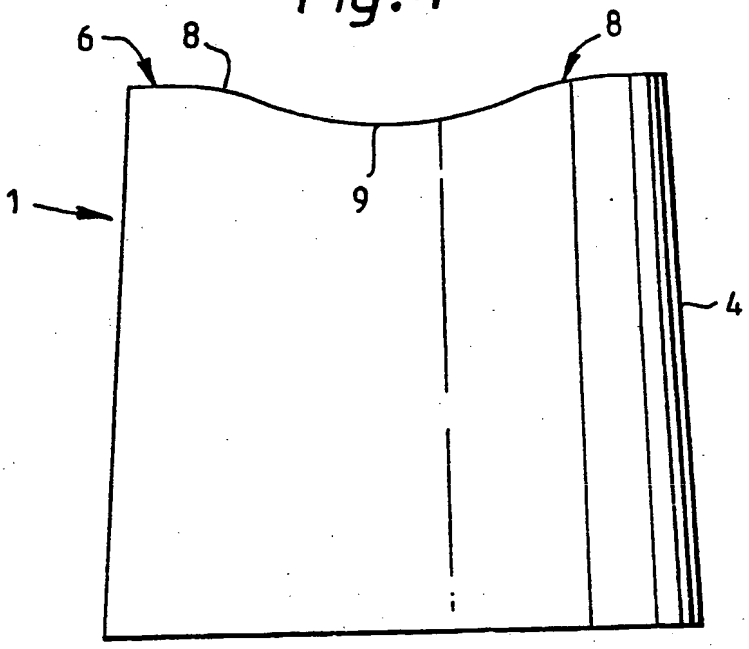
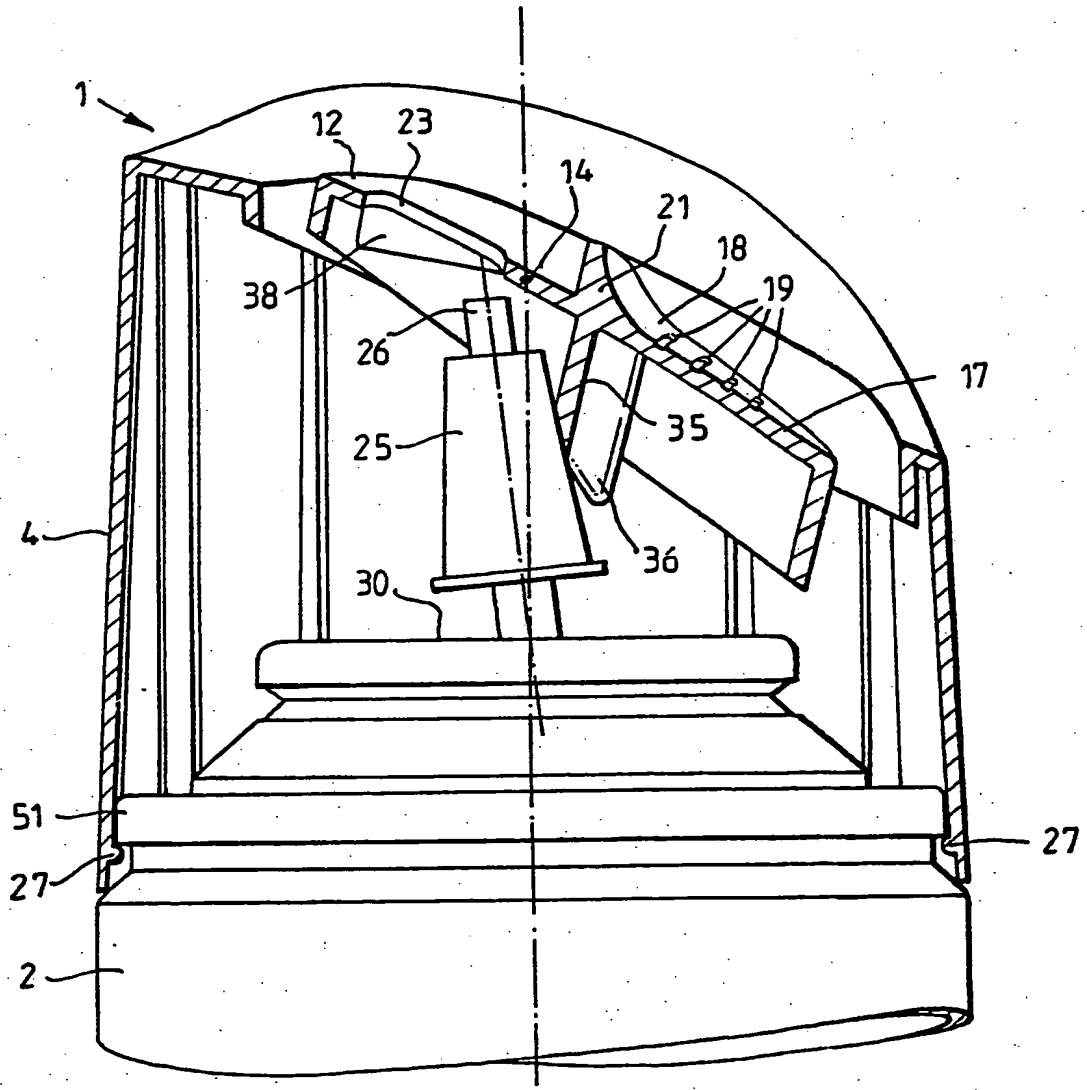


Fig. 5



CAP FOR AEROSOL CONTAINERS

This invention relates to a cap for aerosol containers and to aerosol containers fitted therewith, and especially aerosol containers equipped with a tilt action valve.

Aerosol containers utilise various mechanisms to discharge and direct the pressurised contents of the container, including cap assemblies with finger actuators which assemblies attach onto aerosol containers, see for example U.S. Patents Nos. 4,426,026, 4,328,911, 4,068,782, 3,946,911, 3,888,392, 3,785,536 and 3,236,421.

U.S. Patent 4,068,782 discloses an overcap for an aerosol container with a tilt valve comprising a wall having a lid with an opening. An actuator is positioned in the opening and hinged to the wall at the rear of the overcap. A bore located in the front end of the actuator and disposed at the centre of the wall encloses the valve stem of the tilt valve. Depressing the actuator causes it to rotate forward about its hinge resulting in displacement of the bore. As a result, the tilt valve is displaced by the wall of the bore and actuated. The tip of the tilt valve stem is near the top of the actuator so that the product stream does not get trapped in the cup.

U.S. Patent 4,426,026 also discloses an overcap comprising a closed wall with a lid having an actuator hinged at the rear end of the wall. A product flow hole is located in the actuator directly above the valve stem. Plural projection means extending from the bottom of the actuator form a surface for engaging the valve stem. As the actuator is depressed, it rotates forward about the hinge at the rear of the wall. The engaging surface contacts the valve stem, tilting it, resulting in product flow in the actuator.

Prior overcaps have a complex design that is difficult and expensive to manufacture. Further, prior overcaps generally employ levers to actuate valves that, at one end, are hingedly mounted to the cap and, at the other end, are in contact with the valve. The actuating force from a finger is applied between the two ends such that the actuating force is applied at the same point as or nearer to the hinge than the valve force. Consequently, a mechanical advantage that could result from using the lever more efficiently is lost. In fact, in some overcaps, the force locations of the actuating force and the

valve force along the lever create a mechanical disadvantage, by locating the finger pad closer to the hinge than the valve stem, thereby requiring increased force to actuate the valve than is necessary.

In accordance with the present invention, an improved cap is provided for aerosol containers having a tilt valve, that cap having an actuator that is hinged to the cap by a pair of hinges disposed coaxially at the opposite sides of the actuator. Preferably, the hinges are torsion hinges. When the actuator is rotated, an engaging means tilts the valve stem, thereby actuating the valve. It has been found that this construction allows the valve to be actuated with minimal applied-pressure but at the same time still providing precise control over product flow through the valve. It is believed that this results from the efficient use of the actuating force, including utilisation of a mechanical advantage in the actuator design, as well as the use of dual torsion hinges in a unique manner.

Preferably, the actuator, cap, and hinges are integrally moulded in a single piece from an elastic material such that the hinges are shafts that twist as the actuator is depressed. Consequently, as the actuator is released, the hinges act as torsion springs, returning the actuator to its rest position. An arcuate web is preferably mounted at the bottom of the actuator to engage the valve stem, thereby reducing the displacement of the actuator required to actuate the valve and the strain on the hinges. The finger pad of the actuator is preferably positioned so that the actuating force from the finger is further from the hinges than the force from the valve stem, thereby resulting in a mechanical advantage for the actuating force.

In one aspect the invention resides in an actuator cap for tilt action valved aerosol containers, said cap comprising an annular skirt by means of which the actuator cap may be mounted on the top rim of a tilt action valved aerosol container in surrounding relationship to the tilt action valve, an actuator pivotally mounted relative to the skirt member by a pair of oppositely directed hinge shafts extending from opposite sides of the actuator providing a pivot axis about which the actuator may be pivoted by means of finger pressure applied thereto, that axis intersecting the axis of the valve stem when in its rest position, and a contact member downwardly dependent from the actuator

and engageable with the valve stem of the tilt action valved aerosol container when the cap is mounted thereon and as the actuator is pivoted about said axis by said applied finger pressure thereby to tilt the said valve stem with consequent opening of the valve and discharge of the pressurised contents of the container through the tilted valve stem.

In a more preferred aspect the invention resides in an actuator cap for a tilt action valved aerosol container, said cap comprising a cap member having a top surface with an annular skirt member downwardly dependent from the periphery of the top surface for mounting the cap on the rim of the aerosol container so as to enclose the valve of the container, an elongated opening in the top surface having opposite sides and end walls and extending diametrically across the top surface, an elongated actuator member pivotally mounted in the elongate opening by means of a pair of oppositely directed and aligned pivot shafts positioned intermediate the ends of the actuator member and pivotally connecting the actuator member to the opposite side walls of said opening, the elongate actuator member having opposite side and end walls being spaced from the opposite side and end walls of the opening so as to enable the actuator member to pivot about the pivot axis provided by said oppositely directed and aligned pivot shafts, a finger pad formed on the upper surface of the actuator member adjacent one end thereof remote from the pivot axis, an actuator web downwardly dependent from the underside of the actuator member and engageable at its distal end with the surface of an actuator button mounted on the valve stem of the aerosol container and at a point below the top surface of the actuator button, said web being positioned between the pivot axis of the actuator and the finger pad so that, when the cap is mounted on the aerosol container and finger pressure is applied to the finger pad on the upper surface of the actuator member, the actuator rotates about the said pivot axis to bring the distal end of the actuator web into contact with the side of the actuator button and to transfer that finger pressure by means of an applied mechanical advantage to the actuator button to cause the button to tilt and open the tilt action valve, the said pivot axis either intersecting the axis of the valve stem, when that stem is in its rest position or lying forwardly thereof relative to the finger pad.

The invention will be further described with reference to the accompanying drawings, in which

Fig. 1 is a cross-sectional side view of a cap according to the invention mounted on an aerosol container in the rest condition;

Fig. 1A is a cross-sectional side view of the valve contemplated for use with the cap of Fig. 1 in the rest position;

Fig. 2 is a plan view of the cap of Fig. 1;

Fig. 3 is a view of the underside of the cap of Fig. 1;

Fig. 4 is a front elevational view of the cap of Fig. 1;

Fig. 5 is a cross-sectional side view of the cap of Fig. 1;

Fig. 5A is a cross-sectional side view of the valve mechanism contemplated for use with the cap of Fig. 1 in the actuated position.

Referring to the drawings, Fig. 1 shows the cap 1 of the present invention mounted on an aerosol container 2 (shown in part) and in the rest (non-actuated) position. The cap 1 comprises a closed side wall 4 that engages the top of the container 2. The outer diameter of the wall 4 near the bottom is incrementally greater than the diameter of the container 2 and narrows slightly towards the top of the wall forming a cone. The front of the wall 4 is preferably higher than the rear of the wall. A lid 6 integral with the top of the wall 4 slants downwardly from the front towards the rear of the container 2.

Typically, a bead 51 having an outer diameter slightly less than that of the body of the container 2 is provided around the rim of the container. A valve 30, shown best in Figs. 1A and 5A, is mounted in a conventional manner in a valve mounting cup crimped to the rim of the container 2. An Apache Tile Button 60, available from Precision Valve Corporation, is mounted on the valve stem 25. The button is a conical case that increases the effective diameter of the valve stem 25. A valve stem 25 extends from the valve 30, along the axis of the container 2. A valve outlet 26 is disposed concentrically at the top of the valve stem 25 so that the axis 24 of the valve stem runs through the valve outlet. While the valve stem 25 is displaced during operation of the valve 30, for purposes of this disclosure, the valve axis 24 is always the axis of the valve stem in the rest position. The tilt valve can utilise any one of the different designs known in the art for tilt actuation. However, the cap of the present invention is designed for use on the Tilt Actuated 202 Necked-In Aerosol Container

manufactured by and available from the present applicants.

Fig. 1A is a cross-sectional side view of the tilt actuated valve 30 used in the rest position. A dip tube 55 is mounted at the bottom of the tilt valve 30. The valve stem 25 is biased toward the top of the valve 30 by a spring 56 seated in a chamber 58 in the valve 30. A gasket 57 is mounted at the top of the chamber 58 which gasket sealingly engages the valve stem 25 in the rest position. A product flow path 100 (shown by arrows) runs from the bottom of the container 2 through the tube 55, into the valve 30. In the valve 30, the product flow path 100 runs through the chamber 58. In the rest position, the gasket is sealingly engaged to the valve stem 25, thereby preventing product flow. As described below, when the valve stem 25 is tilted, the valve stem breaks sealing engagement with the gasket 57, permitting product flow through a passage 59 in the valve stem that leads to the valve outlet 26.

Referring to Fig. 1, an opening 10 is located in the lid 6 and surrounds the axis 24 of the valve stem 25 when the cap 1 is mounted on the container 2. An actuator 12 is positioned within the opening 10, evenly spaced from the edges of the opening, and is mounted therein on two oppositely directed integrally formed hinge members 14 (see Figs. 2 and 3) which form a pivot axis for the actuator 12 within the opening 10. The actuator is divided into a front portion 16 and a rear portion 17 lying on opposite sides of the axis 24 of the valve stem 25. As described more fully below, when the operator exerts force down on the rear portion 17, the actuator 12 is rotated about the pivot axis formed by the two hinge members 14, that axis intersecting or lying forwardly of the axis of the valve stem 25 when in its rest position and preferably intersecting that axis as shown in Figures 2, 3 and 5.

A finger pad 18 is located on the rear portion 17 of the actuator 12 where the operator's finger will apply the actuating force. The finger pad 18 is preferably composed of finger ridges 19 and a finger lip 21. The finger ridges 19 are positioned on the rear portion 17 of the actuator 12 in order to improve the grip of an operator's finger. The curved lip 21 is positioned on the rear portion 17 and in front of the ridges 19. The curved surface of the lip 21 cradles the finger to increase comfort and improve grip. Further, the location of the actuating force from the finger can be thereby controlled such that a

mechanical advantage is obtained by requiring the finger to contact the actuator 12 at a point further from the pivot of the actuator located at the hinges 14 (Fig. 2) than the point at which the force of displacing the valve stem 25 contacts the actuator.

A product flue 23 is located in the front portion 16 of the actuator 12. The product flue 23 is more clearly shown in Fig. 2, which is a top view of the cap 1 of the present invention. The rear of the flue 23 is disposed slightly in front of the valve outlet 26 when the actuator 12 is in its rest position. As described more fully below, the flue 23 is positioned such that when the actuator 12 is rotated to actuate the valve 30, the flue is located directly in line with the displaced valve outlet 26 and the product stream.

In the preferred embodiment, chords 27 protrude from the inner surface of the wall 4 near the bottom of the wall. When the cap 1 is mounted onto the container 2, the chords engage the bead 51, preventing the cap from sliding off. Any cap attachment means known in the art, however, would suffice to practice the invention.

Ribs 29 are preferably mounted on the inner surface of the wall 4. The ribs 29 comprise flanges protruding radially inward, extending from the lid 6 to a point near the bottom of the wall but above the chords 27. Sufficient space exists between the bottom of the ribs 29 and the chords 27 to accommodate the bead 51. The ribs 29 give added strength to the cap 1 and prevent the cap from sliding too far down on the container 2.

A support wall 31 is preferably located on the bottom of the lid 6 at the edge of the opening 10. Similarly, a support ridge 33 is preferably disposed at the periphery of the actuator 12, extending downwardly. The support wall 31 and support ridge 33 strengthen the lid 6 and actuator 12, respectively, preventing them from deforming during use and add to the overall aesthetic appearance of the cap.

A means for engaging the tilt button 60 of the valve stem 25 when the actuator 12 is rotated is mounted on the cap 1. Preferably, a valve actuating web 35 extends down from the bottom of the actuator 12 in the rear portion 17. As seen in Fig. 3, a bottom view of the cap of Fig. 1, the bottom of the web 35 is in the shape of a circular arc, centred at the axis of the wall 4. The bottom of the web 35 extends to below the top of the tilt button 60. In the rest condition, the web is

separated from the button 60 by a very small distance (preferably about 1.27mm or less). Web trusses 36 are preferably attached to the bottom of the actuator 12 and the rear face of the web 35 in order to give lateral support to the web, preventing the web from bending back as it contacts the button 60 during operation.

Ramped barriers 38 protrude from the bottom of the actuator 12 adjacent to the product flue 23. The barriers 38 add some strength to the actuator 12, helping to prevent deformation of the actuator.

As shown in Fig. 2 the hinge shafts 14 are mounted coaxially on the sides of the actuator 12 such that the axis of the hinge shafts 14 are mounted at the bottom of the support ridge 33. The hinge shafts 14 are also mounted to side portions 8 of the lid 6. Preferably, the hinge shafts 14 are mounted at the bottom of the support wall 31. Preferably, the entire cap 1 including the lid-hinge-actuator assembly is integrally moulded from a single piece of polypropylene, preferably a homopolymer with a melt between 6 - 18 or PD701 with a melt of 35. However, the hinge shafts 14 could be any hinges mounted at the sides of the actuator 12 and still practice the invention. The hinge shafts preferably have a with (back to front) in the range 2.03 to 4.45 mm and a thickness (top to bottom) in the range 1.02 to 2.29 mm. For use with the above-mentioned PVC Tilt Actuated 202 Necked-In Container the preferred dimensions for the hinge shafts are 4.06 x 2.03 mm located with their centres at a distance of from 5.33 to 5.59 mm from the top surface of the actuator.

Preferably, the opening 10 is nearly oval-shaped, tapering down slightly from the front to the rear. The actuator 12 has the same shape as the opening 10 and is evenly spaced from the edges of the opening.

A lock tab 28 is preferably attached to the rear portion 17 of the actuator 12 and the rear of the lid 6. The lock tab 28 prevents the actuator 12 from accidentally rotating and thereby actuating the valve 30 during shipping. The lock tab 28 is removed before use.

Fig. 3 is a bottom elevational view of the cap 1 of Fig. 1. The web 35 is a portion of a circular arc with its centre located at the axis of the wall 4. When the cap 1 is mounted on the container 2, the axis of the wall 4 should be coincident with the axis 24 of the valve stem 25. Consequently, the web 35 partially encloses the valve stem 25

and the button 60. The web 35 has a radius of curvature slightly larger than the button 60 so that if the stem axis 24 and the centre of the web do not precisely align, the web will still engage the button as the actuator 12 is rotated.

Fig. 4 is a front view of the cap 1 of Fig. 1. The lid 6 preferably curves down along slanted side portions 8 to create a channel 9 in the centre of the lid, running downward from front to back. The finger of the operator can fit comfortably in the channel 9 as the container 2 is held from the rear.

To attach the cap 1 to the container 2, the cap is pushed onto the container 2. The bead 51 at the top of the container 2 deforms the wall 4 as it contacts the chords 27. As the chords 27 slide over the bead 51, the wall 4 returns to its nondeformed position with the chords locked under the bead. The ribs 29 prevent the cap 1 from sliding too far down the container 2. At this point, the valve stem 25 is disposed generally coaxially within the wall 4 of the cap 1 (as shown in Fig. 1).

Fig. 5 is a cross-sectional side view of the cap 1 of Fig. 1 in the actuated position. To operate the aerosol container utilising the cap 1 of the present invention, the operator grasps the container 2 such that a finger rests on the finger ridges 19 and abuts the finger lip 21. The operator depresses the rear portion 17, causing the actuator 12 to rotate backwards in the hole 10 about the axis of the hinge shafts 14 (position indicated) as the hinge shafts twist. Rotating the rear portion 17 of the actuator 12 causes the arcuate web 35 to contact and displace the button 60 which tilts the valve stem 25.

Fig. 5A is a cross-sectional side view of the valve 30 in the actuated position. The valve stem 25 is tilted thereby displacing the passage 59 from sealed engagement with the gasket 57, permitting product flow through the passage and out the valve outlet 26. The valve stem 25 resists displacement due to the forces of the spring 56 and the gasket 57, resulting in a force on the web 35. When the actuating force on the actuator 12 is removed, the spring 56 returns the valve stem 25 to its rest position in sealed engagement with the gasket 57, closing the passage 59, as shown in Figure 1A. Referring again to Fig. 5, the force on the web 35 acts on the actuator 12 at the point where the web joins the actuator. As will be seen, the web 35 is

positioned nearer the hinge shafts 14 than the finger lip 21 so that a mechanical advantage in operating the cap 1 is obtained.

As the rear portion 17 is rotated downward and forward, the front portion 16 of the actuator 12 is rotated upward and rearward. Consequently, the product flue 23 is displaced upward and rearward. The valve outlet 26, which was directed at the actuator 12, is moved forward as the valve stem 25 is tilted, such that the valve outlet and the product stream are now directed forward and coincide with the product flue 23, as shown in Fig. 5. As a result, the product stream is directed through the flue 23 which is sized such that the product stream will go through the flue even if there is a small error in alignment between the cap 1 and the container 2.

After propelling the desired amount of product, the operator releases the rear portion 17 of the actuator 12. The hinge shafts 14, acting as torsion springs, rotate the actuator 12 back to the original position, allowing the valve stem 235 to return to its original position and stop product flow. It should be noted that even if the hinges created no torsional spring force, the force from the valve stem 25 through the button 60 upon the actuator 12 as the stem naturally returned to its closed position would be sufficient to return the actuator to its original position, ready for the next use.

It has been found that the cap made in accordance with the present invention is easier to actuate than caps of the prior art. This makes the product more attractive to consumers and prevents finger fatigue during prolonged use.

CLAIMS:

1. An actuator cap for tilt action valved aerosol containers, said cap comprising an annular skirt by means of which the actuator cap may be mounted on the top rim of a tilt action valved aerosol container in surrounding relationship to the tilt action valve, an actuator pivotally mounted relative to the skirt member by a pair of oppositely directed hinge shafts extending from opposite sides of the actuator providing a pivot axis about which the actuator may be pivoted by means of finger pressure applied thereto, that axis intersecting the axis of the valve stem when in its rest position, and a contact member downwardly dependent from the actuator and engageable with the valve stem of the tilt action valved aerosol container when the cap is mounted thereon and as the actuator is pivoted about said axis by said applied finger pressure thereby to tilt the said valve stem with consequent opening of the valve and discharge of the pressurised contents of the container through the tilted valve stem.

2. An actuator cap according to claim 1, wherein said hinge shafts act as torsion springs to bias the actuator into a neutral, non-actuating position in the absence of said applied finger pressure, and which serve to return the actuator back into said neutral position upon release of said finger pressure.

3. An actuator cap according to claim 1 or 2, wherein the contact member comprises a web downwardly dependent from and integral with the actuator.

4. An actuator cap according to claim 3, wherein said downwardly dependent web is provided with one or more stiffening ribs or trusses.

5. An actuator cap according to any one of claims 1 to 4, wherein the upper surface of the actuator is provided with a finger pad for engagement by the said finger when said finger pressure is applied to the actuator to operate the valve, said finger pad being located on the actuator at a distance from the axis of said hinge shafts that is greater than the distance of said contact member from the axis of said hinge shafts.

6. An actuator cap according to claim 5, wherein the finger pad formed on the upper surface of the actuator comprises a pad portion engageable by the ball of the finger when said pressure is to be applied thereto and an upstanding web adjacent the forward edge of said pad portion for engagement by the tip of the finger.

7. An actuator cap according to any one of the preceding claims wherein the cap is in the form of a closure member for the aerosol container and comprises a top end surface from the rim of which extends skirt for attachment of the cap to the container, said actuator being pivotally mounted, by means of said oppositely directed hinge shafts, in an aperture provided in said top closure surface.

8. An actuator cap according to claim 7, wherein the actuator and the top closure surface of the cap are substantially coplanar.

9. An actuator cap according to claim 7 or 8, wherein the top closure surface of the cap is inclined to the axis of the skirt member.

10. An actuator cap according to claim 7, 8 or 9, wherein the said hinge shafts extend from and are connected between opposite sides of the actuator and the adjacent edges of the said aperture thereby to pivotally mount the actuator in said aperture.

11. An actuator cap according to any one of claims 1 to 10 wherein the hinge shafts are integral with the actuator.

12. An actuator cap according to any one of claims 1 to 11, which is in the form of a single integral plastics moulding.

13. An actuator cap according to any one of claims 1 to 12, wherein the actuator extends over and covers the exposed end of the valve stem, when the cap is mounted on the container, and wherein the actuator has a flue opening formed therein forwardly of said valve stem and through which the contents of the container are discharged when the valve member is tilted by said applied finger pressure, that tilting serving to bring the exposed end and discharge aperture of the valve stem

substantially into line with the flue opening in the actuator.

14. An actuator cap according to claim 13 wherein the underside of the actuator is provided with one or more vanes which serve to direct the flow from the valve stem towards and through said flue aperture.

15. An actuator cap according to any one of claims 1 to 14, wherein removable locking means are provided to lock the actuator in a neutral position during transport and storage.

16. An actuator cap for a tilt action valved aerosol container, said cap comprising a cap member having a top surface with an annular skirt member downwardly dependent from the periphery of the top surface for mounting the cap on the rim of the aerosol container so as to enclose the valve of the container, an elongated opening in the top surface having opposite sides and end walls and extending diametrically across the top surface, an elongated actuator member pivotally mounted in the elongate opening by means of a pair of oppositely directed and aligned pivot shafts positioned intermediate the ends of the actuator member and pivotally connecting the actuator member to the opposite side walls of said opening, the elongate actuator member having opposite side and end walls being spaced from the opposite side and end walls of the opening so as to enable the actuator member to pivot about the pivot axis provided by said oppositely directed and aligned pivot shafts, a finger pad formed on the upper surface of the actuator member adjacent one end thereof remote from the pivot axis, an actuator web downwardly dependent from the underside of the actuator member and engageable at its distal end with the surface of an actuator button mounted on the valve stem of the aerosol container and at a point below the top surface of the actuator button, said web being positioned between the pivot axis of the actuator and the finger pad so that, when the cap is mounted on the aerosol container and finger pressure is applied to the finger pad on the upper surface of the actuator member, the actuator rotates about the said pivot axis to bring the distal end of the actuator web into contact with the side of the actuator button and to transfer that finger pressure by means of an applied mechanical advantage to the actuator button to cause the button to tilt and open

the tilt action valve, the said pivot axis either intersecting the axis of the valve stem, when that stem is in its rest position or lying forwardly thereof relative to the finger pad.

17. An actuator cap according to claim 16, wherein the actuator web has a concave front face, that being the face which engages the said actuator button, when the said is mounted on the aerosol container.

18. An actuator cap according to claim 17, wherein the radius of curvature of the front face of the web is slightly larger than the radius of curvature of the side wall of the actuator button at the point of contact between the actuator button and the actuator web.

19. An actuator cap according to claim 16, 17 or 18, wherein the actuator web is stiffened by means of one or more trusses provided to the rear of the web when considered relative to said valve stem.

20. An actuator cap according to any one of claims 16-19, which is a one piece plastics moulding.

21. An actuator cap according to any one of claims 19-20, wherein the actuator member is provided with a flue opening, which, when the cap is fitted to the container, is offset from the valve axis when in its rest position in the direction in which the valve stem is tilted when actuated by finger pressure applied to the finger pad, the flue opening when the valve stem is so tilted then being aligned with the flue opening for the discharge of the contents of the container through the valve stem and through the now aligned flue opening in the actuator member.

22. An actuator cap according to claim 1 or 16, substantially as hereinbefore described with reference to the accompanying drawings.

23. A tilt action valved aerosol container when equipped with an actuator cap as claimed in any one of the preceding claims.

14

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9226982.8

Relevant Technical fields

(i) UK Cl (Edition L) F1R - RCB, R15A

(ii) Int Cl (Edition 5) B65D - 83/14, 83/20

Search Examiner
B F BAXTER

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
27 JANUARY 1993

Documents considered relevant following a search in respect of claims 1-23

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identification of document and relevant passages	Relevant to claim(s)

Categories of documents

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